

CLAIMS

1. An electrically conductive polymeric article including a polymeric material capable of exhibiting electrical conductivity;

the polymeric material being rendered electrically conductive by treatment with a viologen salt.

2. An electrically conductive polymeric article according to claim 1 wherein the polymeric material is chosen from polymers derived from aromatic bases and from polymers derived from heterocyclic bases.

3. An electrically conductive polymeric article according to claim 2 wherein the polymeric material is chosen from polyaniline and its derivatives.

4. An electrically conductive polymeric article according to claim 2 wherein the polymeric material is chosen from polypyrrole and its derivatives.

5. An electrically conductive polymeric article according to claim 3 wherein the polymeric material is polyaniline.

6. An electrically conductive polymeric article according to claim 4 wherein the polymeric material is polypyrrole.

7. An electrically conductive polymeric article according to Claim 5, wherein the polyaniline base material has an oxidation state between the leucoemeraldine (0% oxidation state) and the emeraldine (50% oxidation state).

8. An electrically conductive polymeric article according to Claim 1, wherein the polymeric material is in the form of a film, film coating, or powder.

9. An electrically conductive polymeric article according to Claim 8, wherein the polymeric material is deposited on a suitable substrate.

10. An electrically conductive polymeric article according to Claim 1, wherein the viologen salt is a viologen dihalide.

11. An electrically conductive polymeric article according to claim 10 wherein in the viologen dihalide the substituents on the bipyridinium are chosen
5 from substituted and unsubstituted alkyl and aryl groups.

12. An electrically conductive polymeric article according to claim 11 wherein the substituted and unsubstituted alkyl groups are chosen from C1 to C4 alkyl optionally substituted with halogen, aryl or substituted aryl.

10 13. An electrically conductive polymeric article according to claim 12 wherein the substituted and unsubstituted alkyl groups are chosen from C1 to C4 alkyl and benzyl.

14. An electrically conductive polymeric article according to claim 10 wherein in the viologen dihalide the halide anions are chosen from chloride, bromide and iodide.

15 15. An electrically conductive polymeric article according to Claim 1, wherein the viologen salt is present in a monomeric or polymeric form.

16. An electrically conductive polymeric article according to Claim 10, wherein the haloviologen material is selected from one or more of benzyl viologen dichloride and poly(butylviologen dibromide).

20 17. An electrically conductive polymeric article according to Claim 5, wherein the resistance of the polyaniline base material, R_s , is reduced from approximately $10^{10} \Omega/\text{sq}$ to approximately $10^6 \Omega/\text{sq}$ or less.

25 18. A method of preparing an electrically conductive polymeric article, which method includes providing

a polymeric material capable of exhibiting electrical conductivity; and
a viologen salt;

contacting a surface of the polymeric material with the viologen salt for a
time sufficient to permit the polymeric material to be rendered electrically
5 conductive.

19. A method according to Claim 18, wherein the polymeric material is a
polyaniline which has an oxidation state between the leucoemeraldine (0%
oxidation state) and the emeraldine (50% oxidation state).

20. A method according to claim 18 wherein the polymeric material is a
10 polypyrrole.

21. A method according to Claim 18, wherein the viologen salt is a
viologen dihalide.

22. A method according to Claim 21, wherein the viologen salt is
selected from one or more of viologen benzyl dichloride and poly(butylviologen
15 dibromide).

23. A method according to Claim 10, wherein the viologen salt is present
in the form of an aqueous solution.

24. A method according to Claim 23, wherein the method is conducted at
a temperature of 0° to approximately 100°C in the presence of air.

25. A method according to Claim 10, wherein the rate of conversion of
the polymeric material to a conducting state is varied by varying one or more of
the type and concentration of the viologen salt, the oxygen concentration,
temperature and exposure to light.

26. An electrically conductive polymeric article whenever prepared
25 according to the method according to Claim 18.